

Date: Wednesday, 15/04/2009 1:37:11 PM  
 User: Julie Dawson

## Process Sheet

<b>Customer</b> : CU-DAR001 Dart Helicopters Services	<b>Drawing Name</b> : X-TUBE AS 350/355 HI FWD
<b>Job Number</b> : 47157	
<b>Estimate Number</b> : 13224	
<b>P.O. Number</b> :	<b>Part Number</b> : D350748141TRN
<b>This Issue</b> : 15/04/2009 <b>S.O. No.</b> :	<b>Drawing Number</b> : D350-748-141 REV D
<b>Prsht Rev.</b> : NC	<b>Project Number</b> : N/A
<b>First Issue</b> : / / <b>Type</b> : CROSSTUBES	<b>Drawing Revision</b> : D
<b>Previous Run</b> : 45381	<b>Material</b> :
<b>Written By</b> :	<b>Due Date</b> : 22/04/2009 <b>Qty:</b> 1 <b>Um:</b> Each
<b>Checked &amp; Approved By</b> : <u>JUD 09.04.15</u>	
<b>Comment</b> : Est Rev:A New Issue 08-03-06 DD verified by:ec Est Rev B Removed polish 08.04.02 EC verified by : DD Est Rev C Remove LPS-3 08.06.23 EC verified by DD	

## Additional Product

Job Number:



<b>Seq. #:</b>	<b>Machine Or Operation:</b>	<b>Description :</b>
----------------	------------------------------	----------------------

1.0	D6017115	Crosstube Material
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**Comment:** Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)  
 Crosstube Material  
 D6017-115  
 2.339" OD X 2.000" ID  
 Batch: 832912

Q.M 09.05.07 ①

2.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE
-----	------------	----------------------------

**Comment:** MORI SEIKI CNC LATHE LARGE

1-Fill tube with sand &amp; install plugs on both ends as per Folio FA648

2-Turn first side as per Folio FA648

3- File transition lines smooth.

Q.M 09.05.07 ①

3.0	QC1	INSPECT ALL DIM TO DIM SHEET
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**Comment:** INSPECT ALL DIM TO DIM SHEET

Q.M 09.05.07 ①

4.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE
-----	------------	----------------------------

**Comment:** MORI SEIKI CNC LATHE LARGE

1-Turn second side as per Folio FA648

2- File transition lines smooth.

Q.M 09.05.07 ①

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

Date: Wednesday, 15/04/2009 1:37:12 PM  
User: Julie Dawson

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: X-TUBE AS 350/355 HI FWD

Job Number: 47157

Part Number: D350748141TRN

Job Number:



Seq. #:

Machine Or Operation:

Description :

3-Scribe Part & Batch as per Dwg D350-748-141

Q.M 09.05.02①

5.0

QC1

INSPECT ALL DIM TO DIM SHEET



Comment: INSPECT ALL DIM TO DIM SHEET

Q.M 09.05.02②

6.0

QC8

SECOND CHECK



AWM 9-5-7



①

Comment: SECOND CHECK

7.0

LARGE FAB 1

LARGE FABRICATION RESOURCE 1



Comment: LARGE FABRICATION RESOURCE 1

AWM 9-5-7

①

Grind machining marks

8.0

OUTSIDE SERV.11

OUTSIDE SERVICE -CROSSTUBES



Comment: Sub-Contracting OUTSIDE SERVICES

Issue P/O: 8796

Heat Treat to min 180 KSI As per Dwg D350-748-141

(MIL-T-6736 OR AMS 2759-1C)

Sand Blast tube after Heat Treat

Possible Supplier: Vac Aero

Ensure Certificate of Conformity is attached

CL09/05/13

①

9.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Receive & Inspect For Transit Damage

Ensure certificate of conformaty is attached

P 9/6/4 ②

10.0

QC6

DIMENSIONAL CHECK



Comment: DIMENSIONAL CHECK

P 9/6/4 ②

11.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and stock in kanban rack

Location: Back hall 9-6-15

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

Date: Wednesday, 15/04/2009 1:37:12 PM  
User: Julie Dawson

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: X-TUBE AS 350/355 HI FWD

Job Number: 47157

Part Number: D350748141TRN

Job Number:



Seq. #:

Machine Or Operation:

Description :

12.0

QC21

FINAL INSPECTION/W/O RELEASE



09/06/15 *[Signature]*

Comment: FINAL INSPECTION/W/O RELEASE

Job Completion.



*MF*  
*09-06-15*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 47157
<b>Description:</b> Crosstube Assembly (AS350/355 High Fwd)		<b>Part Number:</b> D350-748-141
<b>Inspection Dwg:</b> D350-748-141 <b>Rev:</b> D		<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article
 ☐ Prototype

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.242	/			
	2.180	+0.005/-0.000	2.183	/			
	2.180	+0.005/-0.000	2.185	/			
	2.237	+0.005/-0.000	2.242	/			
	2.272	+0.005/-0.000	2.277	/			
	2.306	+0.005/-0.000	2.310	/			
	2.339	+0.005/-0.000	2.339	/			
	2.339	+0.005/-0.000	2.339	/			
	0.062	+/-0.010	0.062	/			
	4.26	+/-0.030	4.282	/			
	R0.063	+/-0.010	R0.063	/			
	R0.50	+/-0.030	R0.500	/			
SIDE B	2.240	+0.005/-0.000	2.242	/			
	2.180	+0.005/-0.000	2.183	/			
	2.180	+0.005/-0.000	2.185	/			
	2.237	+0.005/-0.000	2.242	/			
	2.272	+0.005/-0.000	2.277	/			
	2.306	+0.005/-0.000	2.310	/			
	2.339	+0.005/-0.000	2.339	/			
	2.339	+0.005/-0.000	2.339	/			
	0.062	+/-0.010	0.062	/			
	4.26	+/-0.030	4.282	/			
	R0.063	+/-0.010	R0.063	/			
	R0.50	+/-0.030	R0.500	/			
	110.27	+/-0.060	110.290	/			

<b>Measured by:</b> G.m	<b>Audited by:</b> HVM	<b>Prototype Approval:</b>	N/A
<b>Date:</b> 09.05.07	<b>Date:</b> 9-5-07	<b>Date:</b>	N/A

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	



DESIGN <i>qp</i>	DRAWN BY <i>qp</i>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>	DRAWING NO. D350-748-141	REV. D SHEET 1 OF 3
DATE 06.10.31		TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
A	06.03.31	NEW ISSUE	
B	06.06.30	ADD D6017-115 & PRIME AND PAINT	
C	06.08.14	ADD CAD PLATING	
D	06.10.31	MAG. PARTICLE AND CAD PLATE AS MFD.	

RELEASED  
06.10.31 *[Signature]*

QTY	P/N	DESCRIPTION
X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
1	D6017-115	CROSSTUBE (OR D6015-125)
2	D3502-1	SUPPORT
2	D2856-400-710	ABRASION STRIP
1	AELS-1032-225	INSERT
1	AN960JD10	WASHER
2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
1	MS27039-1-10	SCREW

UNDER REVIEW

09.02.05  
PER PCR #09.001

**D350-748-141 CROSSTUBE:**

- 1) MATERIAL: MANUFACTURED FROM D6017-115 OR D6015-125  
FINISHED LENGTH = 110.27±0.06
- 2) MACHINE PER MACHINING DETAIL ON PAGE 3. BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITIONS SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 3) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 4) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 5) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING
- 6) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 7) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 8) INSTALL D2856-400-710 ABRASION STRIP WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 9) TORQUE MS21920-20 CLAMPS 60 TO 80 IN-LB
- 10) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 11) ALL DIMENSIONS ARE IN INCHES
- 12) PART IS SYMMETRIC ABOUT CENTERLINE EXCEPT FOR Ø0.297 HOLE.

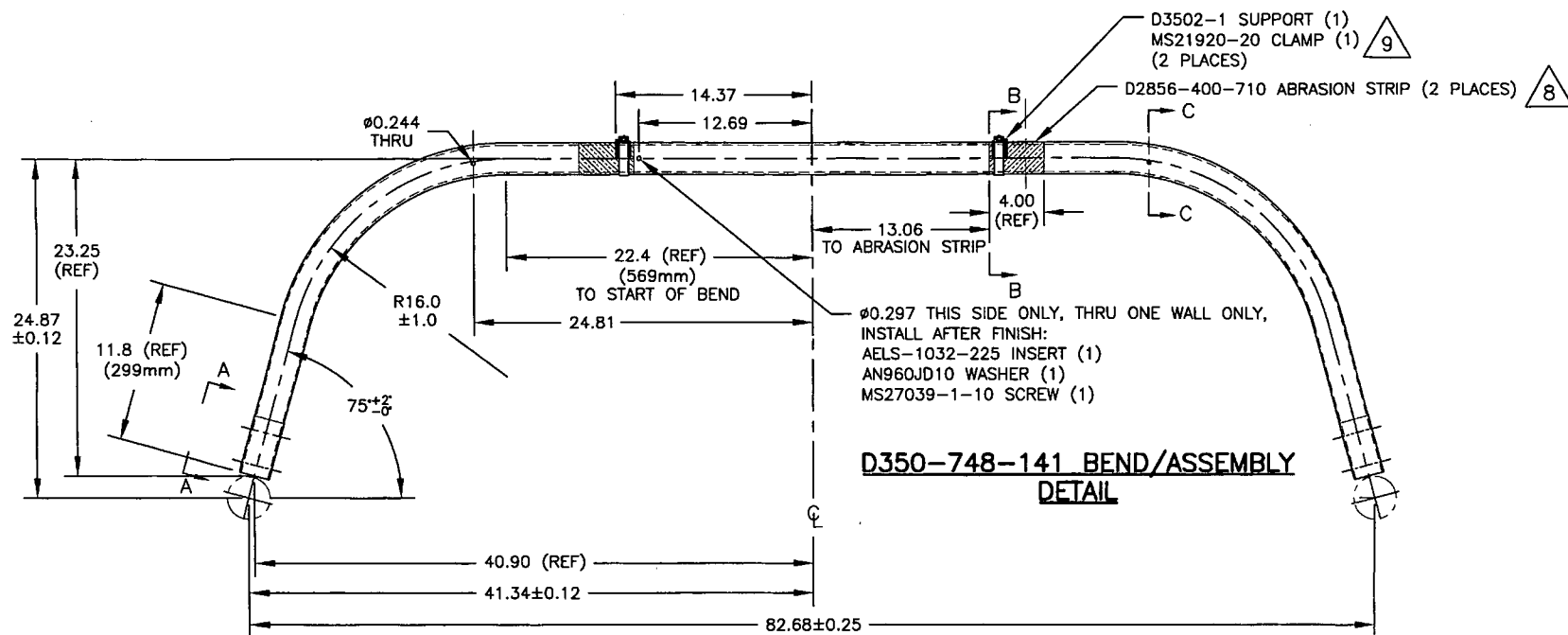
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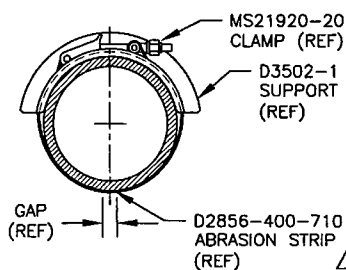
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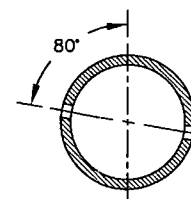
### SECTION B-B

SCALE 1:2



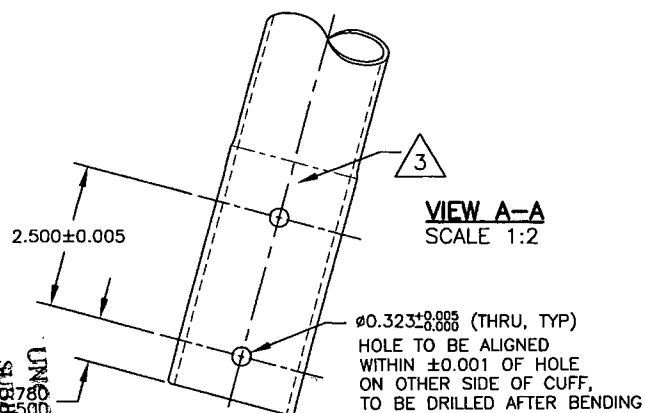
### SECTION C-C

SCALE 1:2



### VIEW A-A

SCALE 1:2



UNDER REVIEW

09.02.05

UNDER REVIEW

02.16

OK 07.10.22

RELEASED

06.10.31

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DESIGN	q2	DRAWN BY	q2	<b>DART</b>	DART AEROSPACE LTD. MISSISSAUGA, ONTARIO, CANADA
CHECKED	th	APPROVED	th	DRAWING NO.	D350-748-141
DATE	06.10.31	TITLE	CROSSTUBE (AS 350/355 HI FWD)	REV. D	SHEET 2 OF 3
				SCALE	1:8

NO. 115  
WORK ORDER  
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**VAC AERO**  
INTERNATIONAL INC.

**RELEASE NOTE**

GST No.: R105468102

OAK 109495-1

☒ **HEAD OFFICE**  
1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489

☐ **2009 WYECROFT ROAD, UNIT B**  
OAKVILLE, ONTARIO  
CANADA L6I 6J4  
TEL: (905) 827-7377 FAX: (905) 827-1330

☐ **QUEBEC DIVISION**  
7450 RUE VÉRITÉ STREET, ST. LAURENT, QUÉBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

05/26/2009

MM / DD / YYYY

PAGE: 1

ILL TO: 1DAR01  
DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

K6A 1K7

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
05/26/2009		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
8796		NET 30 DAYS

PART No.	DESCRIPTION	UOM	QTY ORD	QTY SHPD	TEST RESULTS
----------	-------------	-----	------------	-------------	--------------

D350-748 -141 EA 16 16

Process Specifications: Procedure: 4353  
HEAT TREATED TO 180 KSI MIN. PER AMS 2759-1E  
100% HARDNESS CHECKED AS PER ASTM E-18  
40/45 HRC  
MATERIAL: 4130

P/N D350-748-141-B4715, B47157, P/N D350-748-241-B4717, B47171  
P/N D350-748-141-B4715, B47158, P/N D350-748-241-B4717, B47172  
P/N D350-748-141-B4716, B47159, P/N D350-748-241-B4716, B47165  
P/N D350-748-141-B4716, B47160, P/N D350-748-241-B4716, B47166  
P/N D350-748-141-B4716, B47161, P/N D350-748-241-B4716, B47168  
P/N D350-748-141-B4716, B47162, P/N D350-748-241-B4716, B47169  
P/N D350-748-141-B4716, B47163  
P/N D350-748-141-B4716, B47164  
P/N D350-748-241-B4717, B47170  
P/N D350-748-241-B4716, B47167

**100% HARDNESS TESTED**

16 pcs

42/43 HRC



hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant hereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.



HEAT TREATING INSTITUTE

*Jana Robinson*  
Authorized Q.C. Inspector



Accredited  
**Nadcap**  
Heat Treating • Welding

VACUUM BRAZING • HEAT TREATING • SPECIAL PROCESSING • FURNACE EQUIPMENT  
TURBINE COMPONENT OVERHAUL • PLASMA AND OTHER COATINGS